

AIR FORCE PROGRAMS

C-5 Avionics Modernization Program (AMP) and the Reliability Enhancement and Re-engining Program (RERP)

The current C-5 fleet operates throughout the Air Force active, reserve, and National Guard components in various missions and environments. C-5 missions include strategic airlift, emergency aeromedical evacuation, airland transport of a brigade-size force in conjunction with other organic aircraft and transport of outsize/oversize cargo. The C-5 aircraft must perform missions at night and in adverse weather, and be capable of receiving fuel in-flight during intercontinental missions.

C-5 modernization encompasses both the Avionics Modernization Program (AMP) and the separate Reliability Enhancement and Re-engining Program (RERP) denoted C-5 AMP/RERP. The full modernization effort incorporates a “glass cockpit” with digital avionics, a new aircraft propulsion system, and reliability improvements. Modified commercial engines, nacelles, thrust reversers, and pylons will be integrated into the legacy C-5 airframe. The anticipated performance improvements are intended to optimize cargo carrying capabilities, to include fully loaded take-offs and landings on relatively short runways, and to meet the performance requirements of the Global Air Traffic Management initiative. Additionally, the re-engining is intended to provide significant reliability, maintainability, and availability improvements. A commercial engine support concept (including two levels of maintenance and warranties) will be integrated into the C-5 logistics support system infrastructure. Candidate subsystems for reliability enhancement include the flight control, hydraulics, environmental control, electrical, and fuel systems. Specific upgrades and the extent of the expected reliability improvement will be identified from a series of trade studies.

The C-5 was developed and procured prior to the statutory requirement for LFT&E. Hence, the basic aircraft has never completed a system-level live fire evaluation. The RERP modification is an Acquisition Category I program and is a covered program for LFT&E. The C-5 RERP Test and Evaluation Master Plan was approved October 2001 in support of a Milestone B review.

TEST & EVALUATION ACTIVITY

A combined test force is located at the contractor facility in Marietta, Georgia. The combined test force includes the contractor and government personnel performing combined developmental and operational testing. Co-locating personnel allows for greater test efficiency and less duplication. C-5 AMP laboratory and flight tests are ongoing.

The first flight of a C-5 AMP aircraft (a B model) was accomplished on December 21, 2002. A second AMP test aircraft (an A model) flew in 2003. Software installation is planned to occur in four versions. Versions 1.1 and 1.2 have been flight-tested. Development, laboratory tests, and flight tests of Version 2.1 have slipped due to software problems identified in the earlier versions. As a result, development and flight testing of version 2.2 has slipped. The impact to the RERP timeline is not yet clear.

Several live fire activities were completed in 2003. Wing leading-edge fire suppression system baseline LFT&E testing was completed in April 2003. The engine fan rotorburst analysis was completed in May 2003, and ballistic testing of C-5 honeycomb structure surrogate sandwich panels was completed in June 2003.



The C-5 Avionics Modernization Program and the Reliability Enhancement and Re-engining Program incorporate a “glass cockpit” with digital avionics, a new aircraft propulsion system, and reliability improvements.

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TEST & EVALUATION ASSESSMENT

There is a high schedule risk for the C-5 AMP development and test programs. The C-5 AMP schedule has slipped at least four months from the original schedule. If not completed as planned, this high-risk schedule will impact the C-5 RERP schedule. The C-5 RERP program is dependent upon the success of the C-5 AMP program.

A preliminary reliability demonstration, included as part of the RERP IOT&E, is required prior to the RERP full-rate production decision. In the current Test and Evaluation Master Plan, four aircraft are planned to fly approximately 200 sorties for approximately 800 flying hours between IOT&E and the reliability demonstration. Due to funding issues, the number of aircraft for developmental testing was reduced to three. This may impact the number of aircraft available for IOT&E. In order to assess the impact to IOT&E, AFOTEC is developing a model and the Air Mobility Command is providing field data. The model will be used to verify IOT&E planning and the viability of a three-aircraft reliability evaluation.

The LFT&E engine fan rotorburst analysis examined the trajectories of various-size fragments arising from an in-flight engine fan failure. The analysis indicated that the probability of inducing damage to C-5 critical systems was negligible; and therefore, in-flight engine fan rotorburst does not contribute to the overall system-level vulnerability of the C-5.